If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

15.5.14 Calibration of Thermocouple Gauge

(Vacuum Group ProcedureVA-008.18.1.14)

Note: This document was formerly a C-A Group Procedure. The content of the group procedure was reviewed by the Technical Supervisor. All approvals and/or issue dates of the original group procedure are maintained for present use.

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

S. Gill

Vacuum Group Procedure VA-008.18.1.14
Original Issue Date: 01/01/00
Revision 01

*****IMPORTANT*****

PRIOR TO THE PERFORMANCE OF ANY WORK WITHIN THE SCOPE OF THIS PROCEDURE, IT IS THE RESPONSIBILITY OF THE SUPERVISOR TO ENSURE THAT ***WORK PLANNING*** HAS BEEN REVIEWED FOR THE PROTECTION OF WORKERS, EQUIPMENT, AND THE ENVIRONMENT.

1. PURPOSE:

1.1 TO PROVIDE AN EFFECTIVE PROCEDURE FOR AGS VACUUM TECHNICIANS TO SUCCESSFULLY CALIBRATE A THERMOCOUPLE GAUGE.

2. RESPONSIBILITIES:

2.1 THE AGS VACUUM SUPERVISOR SHALL BE RESPONSIBLE FOR THE IMPLEMENTATION OF THIS PROCEDURE.

SECTION 5

CALIBRATION

8.18.1.14

Each gauge tube is individually calibrated for N_2 and air and temperature compensated prior to leaving the factory. Each controller is also individually calibrated to provide accurate readout of N_2 and air pressure of any calibrated gauge tube. Therefore, initial calibration should not be necessary. See Section 6 for use with gases other than N_2 and air. If the tube becomes contaminated or does not read correctly, the gauge and controller can be calibrated as a system from the front panel adjustments by performing the following steps. This procedure can also be used to readjust the controller for use with long cables.

Zero Adjust

1. Evacuate the system to a pressure less than 10^{-4} Torr or 10^{-4} mbar.

2. With the Series 275 system operating, set the readout to zero by adjusting the VAC potentiometer.

Atmosphere Adjust

1. Allow the system pressure to rise to atmospheric pressure of air.

2. Adjust the ATM potentiometer until the pressure indication agrees with the absolute atmospheric pressure as read on an accurate barometer. Use absolute pressure, not corrected to sea level.

NOTE: 1 atmosphere normal at sea level = 760 Torr = 1013 mbar.

SECTION I

SAFETY INSTRUCTIONS

SAFETY PAYS. THINK BEFORE YOU ACT. UNDERSTAND WHAT YOU ARE GOING TO DO BEFORE YOU DO IT. READ THIS INSTRUCTION MANUAL BEFORE INSTALLING, USING, OR SERVICING THIS EQUIPMENT. IF YOU HAVE ANY DOUBTS ABOUT HOW TO USE THIS EQUIPMENT SAFELY, CONTACT THE GRANVILLE-PHILLIPS PRODUCT MANAGER FOR THIS EQUIPMENT AT THE ADDRESS LISTED ON THIS MANUAL.

Explosive Gases

Do not use the gauge tube to measure the pressure of combustible gas mixtures. The sensing element normally operates at only 125°C but it is possible that momentary transients or controller malfunction can raise the sensor above the ignition temperature of combustible mixtures which might then explode causing damage to equipment and injuring personnel.

High Pressure Operation

Do not use a compression mount (quick connect) for attaching the gauge tube to the system in applications resulting in positive pressures in the gauge tube. Positive pressures might blow the tube out of a compression fitting and damage equipment and injure personnel. The Series 275 gauge is not intended for use above 1000 Torr or 1333 mbar true pressure.

Tube Mounting Position

If the gauge tube will be used to measure pressures greater than 1 Torr or 1 mbar, the tube must be mounted with its axis horizontal. Although the gauge tube will read correctly below 1 Torr (or 1 mbar) when mounted in any position, erroneous readings will result at pressures above 1 Torr (or 1 mbar) if the tube axis is not horizontal. Erroneous readings can result in over or underpressure conditions which may damage equipment and injure personnel.

Overpressure

Series 275 gauges are not intended for use above 1000 Torr (1333 mbar) true pressure. Do not use above 1000 Torr (1333 mbar) true pressure. Series 275 instruments are furnished calibrated for N_2. They also measure the pressure of air correctly within the accuracy of the instrument. Do not attempt to use a Series 275 gauge calibrated for N_2 to measure or control the pressure of other gases such as argon or CO_2, unless accurate conversion data for N_2 to the other gas is properly used. If accurate conversion data is not used or improperly used, a potential overpressure explosion hazard can be created under certain conditions.

For example, at 760 Torr of argon gas pressure, the indicated pressure on a Series 275 gauge calibrated for N_2 is 24 Torr. At an indicated pressure of 50 Torr, the true pressure of argon is considerably above atmospheric pressure. Thus if the indicated pressure is not accurately converted to true pressure, it is possible to overpressure your system. Overpressure may cause glassware such as ionization gauges to shatter dangerously and if high enough may cause metal parts to rupture thus damaging the system and possibly injuring personnel. See Section 6 for proper use of conversion data.

It is strongly recommended that a pressure relief valve be installed in the system should the possibility of exceeding 1000 Torr (1333 mbar) exist.

High Indicated Pressure

For some gases, be aware the indicated pressure will be higher than the true pressure. For example, at a true pressure of 9 Torr for helium the indicated pressure on a Series 275 gauge calibrated for N_2 is 760 Torr. The safe way to operate the gauge is to properly use accurate conversion data. See Section 6 for proper use of conversion data.

Electrical

Before connecting your controller to a power source, be sure that the source is compatible with power requirements for the controller.

Electrical Power Requirements

A.C. Frequency: 48 to 62 Hz
Power consumption: 10W nominal
Line Voltage: 115V models: 105 to 125 volts
230V models: 210 to 250 volts

Connect the controller only to a 3-wire grounded receptacle. Do not bypass the ground connection. Have only qualified service personnel trained in electrical safety precautions service your controller. Completely disconnect equipment from all power sources before servicing equipment.

115V models are supplied with a standard NEMA 5-15P 3-wire plug. 230V models are supplied with a Western European Dual Grounding CEE(7)-VII plug. If the plug supplied with your controller is not compatible with your power source, the plug may be removed and replaced with a suitable 3-wire grounded plug. It is important that the following color code be followed when replacing the power plug to maintain electrical safety. DO NOT OPERATE THE INSTRUMENT UNGROUNDED because even a minor circuit malfunction could result in dangerous voltages being applied to exposed metal surfaces.

Brown or Black: AC line (hot) Blue or White: AC neutral Green or Green/Yellow: Earth Ground

Chemical

Cleaning solvents, such as trichloroethylene, perchloroethylene, toluene and acetone produce fumes that are toxic and/or flammable. Use only in areas well ventilated to the outdoors and away from electronic equipment, open flames, or other potential ignition sources.

Sensor Failure

If the gauge tube becomes disconnected from the controller or if the sensor wire in the gauge tube fails, the controller will indicate beyond 1000 Torr or mbar and the process controls will be inactivated. The recorder output will be greater than 9 volts. If the tube is unplugged from a powered controller, there may be an instantaneous (0 to 0.2 seconds) drop in the pressure indication before the failsafe takes over, and the process control relays could activate for this brief time, depending on the order in which the tube pins break contact. When reconnecting a gauge tube which is at vacuum to the controller, the AC power to the controller should be removed to prevent damage to the sensor.

Tube Contamination

The calibration of the gauge will be seriously affected by any gas which will attack the gold plated sensor and could result in overpressurizing the system. Two primary gases in this category are mercury vapor and fluorine.